## NOTE

The new claims are sequenced so as to let each dependent claim appear as close to its parent claim as reasonably possible. For the Examiner's convenience, Appendix A shows the substantive correspondence between original claims 1-18 and new claims 21-38.

## REMARKS

The Office action of December 13, 2007, has been received and its contents carefully noted.

As claims 19 and 20 have been deleted, no discussion of their rejection appears to be required.

The new claims, sequenced as mentioned, correspond generally to the originally filed claims, with appropriate reformulation to overcome the rejections under 35 USC 312. In particular, claim 27, which corresponds to original claim 3, brings out that the integration time of the integration amplifier is set in the calibration operation.

Turning to the rejection of the claims as being obvious in view of the cited prior art, the same is respectfully traversed for the following reasons. There is no teaching in the prior art as a whole that would have caused a person skilled in the art, faced with the objective technical problem, to modify or adapt the system shown in Cole while taking account of that teaching, so as to achieve the what the invention described in the claims achieves. The claims set forth features which are not shown in or made obvious by the references relied in the rejection of the claims, taking singly or in combination with each other. Accordingly, the newly presented claims 21-26 and 28-38 which correspond to

original claims 1, 2 and 4-18 have been retained substantively unchanged.

Concerning the rejection of the claims as being unpatentable over Cole in view of Kadwell et al, Cole discloses a laser Doppler velocimetry system (LDV system) for measuring the direction and speed of fluids. Conceptually, an LDV system consists of highly coherent light split into two beams and sent through a transmitter which crosses the beams in a probe volume to create affixed interference pattern. The aberrations of the optics must be low so that the fringes of the patterns are straight throughout the probe volume. The receiver of an LDV system consists of light collection optics and an ultra-fast-response photodiode. The optics are aligned so that any light reflected from the probe volume is focused onto the active area of a photodiode. When a particle passes through the probe volume, it passes through regions of destructive interference (darkness) and constructive interference (brightness) which the receiver sees as a sinusoidal wave of intensity. Knowing the fringe separation, the frequency of the sinusoid is a measure of the speed of the particle through the probe volume. Appendix B shows a diagram of the method.

Cole shows the use of such an LDV system for monitoring the motion of particles in a sensing volume denoted by the reference numeral 38. In detail, and as depicted in Figure 1 of Cole, the conventional LDV system comprises a transmitter 28 for generating two beams 40 of collimated, monochromatic and coherent laser light. The two beams 40 are made to intersect as their waists (i.e., the focal point of the laser beam), where they

interfere and generate a set of straight fringes.

A receiver, here the sensor 30, is aligned to the flow such that the fringes are perpendicular to the flow direction. As particles pass through the fringes, they reflect light (only from the regions of constructive interference) into the receiver 30. The receiver 30 is constituted by a photomultiplier tube 44 which generates a current in response to the reflected light, this current being transformed into a voltage by a current-to-voltage converter 70. In this respect, see column 7, lines 43 to 47, of Cole.

Thus, in Cole, the detector 30 or photomultiplier tube 44 sees the superposition of two Doppler shifted beams because the sensing volume 38 is formed by the two beams 40 which, respectively, are not perpendicular to the flow direction. Due to the superposition of the two Doppler shifted light signals, the detector 30 or the photomultiplier tube 44 detects a light signal which is a sinusoid (corresponding to the fringes) modified by the Gaussian envelope. In the reference, the frequency f of the sinusoid is also called a "signal frequency" or "Doppler frequency".

In order to isolate the Doppler frequency, i.e., the frequency f of the sinusoid included in the light signal received by the sensor 30 or the photomultiplier tube 44, the sinusoid has to be extracted or isolated from the light signal. This, in Cole, is done by using a bandpass frequency filter; see column 7, line 47-51.

The conventional system according to Cole comprises a bandpass filter 74 and a logarithmic detector 76 to produce a signal proportional to the logarithm of the RF component (i.e., the sinusoid) of the scattered light signal. Also, a linear discriminator 75

is provided which produces a signal proportional to the partial velocity; see column 7, lines 43-61.

As set forth in Cole in column 19, lines 14-24, the RF component (i.e., the sinusoid) of the scattered light signal generated by the sensor 30 or the photomultiplier tube 44 is shown in Figure 10A. Thus, by band pass filtering the scattered light signal, the RF component can be isolated or extracted from the raw light signal generated by the sensor 30 or the photomultiplier tube 44. From the state of the LDV technology it is generally known that the velocity u of the flow can be calculated to be u = f + d, where f is the frequency of the RF component included in the scattered light signal generated by the sensor 30 or photomultiplier tube 44 and the fringe spacing d is known from the calibration.

However, the bandpass filter 74 used in the conventional system according to Cole for isolating the RF component from the light signal of the photomultiplier tube 44 has a <u>well defined bandwidth</u> and a <u>well defined center frequency</u>, both of which are independently adjustable (see Cole at column 7, line 49-51). In fact, the band width and the center frequency of the bandpass filter 74 depend from the frequency of the RF component included in the scattered light signal generated by the sensor 30 or photomultiplier tube 44.

Thus, Cole shows a method for evaluating a scattered light signal generated by a scattered light receiver and the scattered light signal also runs though a filter algorithm operation (bandpass filter 74) to evaluate the scattered light subjected to the bandpass

filter 74. However, in Cole, contrary to the present invention, the scattered light signal is generated by a scattered light receiver (photomultiplier tube 44) when particles are passing through the sensing volume (at 38), and not when detecting particles in a carrier medium. Apart of this, Cole does not show or make obvious that the filter algorithm applied to the scattered light signal is based on a slope of the scattered light signal. Rather, the filter algorithm used in Cole depends from the frequency of the RF component included in the scattered light signal.

As for Kadwell et al, the same discloses a compact particle sensor for detecting suspended particles and is thus suitable for use as a smoke detector in a closed structure, i.e., for providing an early indication of fire. For this purpose, Kadwell et al provides a housing, a light source, a light receiver and a plurality of optical elements. The light source is positioned so as to supply a light beam within a test chamber and the plurality of optical elements are positioned so as to direct the light beam from the light source to the receiver, which is positioned to receive the light beam supplied by the light source.

In order to enhance the sensitivity and accuracy of the sensor, the arrangement shown in Kadwell et al uses both a scatter sensor and an obscuration sensor simultaneously. The teaching in Kadwell et al is based on the conclusion firstly, that a scatter sensor is well suited for detecting gray smoke, i.e., smoke comprising highly reflective particles, and secondly, that an obscuration sensor is well suited for detecting black smoke, i.e., smoke which comprises minimally reflective particles. See Kadwell et al at column 4, lines 14-37.

The combination of a scatter detector and an obscuration detector leads to a

smoke sensor having enhanced sensitivity and accuracy when detecting smoke comprising both gray and black particles. This is set forth specifically in Kadwell et al at column 4, lines 38-42, which states the following:

> *Placing both techniques of particle detection (i.e., scatter and obscuration) in a single particle sensor enhances the ability of the particle detector to detect smoke without increasing false alarms, as compared to a sensor that implements either technique alone.*

Hence, the "single particle sensor" shown in Kadwell et al comprises both a scatter sensor and an obscuration sensor. Both sensors simultaneously produce a measurement signal. In order to generate an alarm signal, the measurement signal produced by the scatter sensor and the measurement signal produced by the obscuration sensor are compared with respectively threshold measurements. Referring to column 4, lines 50-54 of Kadwell et al, the alarm threshold is not a fixed single measurement threshold. Rather the alarm result is preferably based on two or more measurements interacting to create a dynamically adjustable alarm result.

Figure 15 of Kadwell et al shows different measurement thresholds for the scatter detector. See column 38, lines 35-38 which refers to the chart depicted in Figure 15. hus, in Kadwell et al the obscuration sensor can be used to generate an alarm and the scatter sensor can be used to vary the alarm result associated with the obscuration sensor. Specifically, the scatter threshold can be generated as a direct function of the slope of the obscuration detector measurement.

While Kadwell et al discloses that the slope of the obscuration detector measurement can be used in order to generate the scatter threshold, it should be noted that the obscuration detector measurement is clearly not a scattered light signal but a transmitted light signal. Therefore, the scatter threshold, i.e., the alarm threshold for the scatter sensor, is clearly not based on a slope of the scatter light signal but on the slope of a transmitted signal.

It should also be noted that in Kadwell et al the slope of the obscuration detector measurement, i.e., the slope of the transmitted light signal, is clearly not used in order in order to select a filter algorithm operation. Indeed, no reference to any filter operation has been found in Kadwell et al. Rather, it is the slope of the transmitted light signal, i.e., the slope of the obscuration detector measurement, which is used to generate an alarm threshold for the scatter sensor but not for selecting a filter algorithm operation which has to be applied onto the scattered light signal, i.e., the light signal generated by the scatter sensor.

Insofar as Marman is concerned, the same shows a smoke and fire detector which likewise fails to show the features discussed above, indeed, nothing has been in Marman which suggests the use of a filter algorithm or the use of such an algorithm based on the slope of the scattered light signal.

In summary, it is respectfully submitted the references relied on by the Examiner, namely Cole, Kadwell et al and Marman, even if combined with each other, do not make the present invention obvious, as these references are silent with respect to the filter algorithm which has to be applied to a scattered light signal, with the filter

algorithm operation being based on a slope of a scattered light signal. Nor is there any indication in these references that would make obvious the modification or adaptation of the filter algorithm operation used in the LDV system of Cole, so that there is nothing to suggest anything which result in the subject matter defined in the claims now of record.

In view of the above, reconsideration of the rejection of the claims and allowance of the application are respectfully requested.

Should the Examiner believe that an interview would be of value in expediting the prosecution and examination of this application, please call undersigned counsel to arrange for such an interview.

Respectfully submitted,

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George H. Spencer
Registration No. 18,038
Dennison, Schultz & MacDonald
1727 King Street, Suite 105
Alexandria, Virginia 22314
Direct-dial: 703-837-9600 Extension 17

GHS:ab

APPENDIX A

| Amended Claim | Original Claim |
|---|---|
| 21 | 1 |
| 22 | 2 |
| 23 | 10 |
| 24 | 11 |
| 25 | 8 |
| 26 | 9 |
| 27 | 3 |
| 28 | 5 |
| 29 | 6 |
| 30 | 4 |
| 31 | 7 |
| 32 | 12 |
| 33 | 13 |
| 34 | 14 |
| 35 | 15 |
| 36 | 16 |
| 37 | 17 |
| 38 | 18 |

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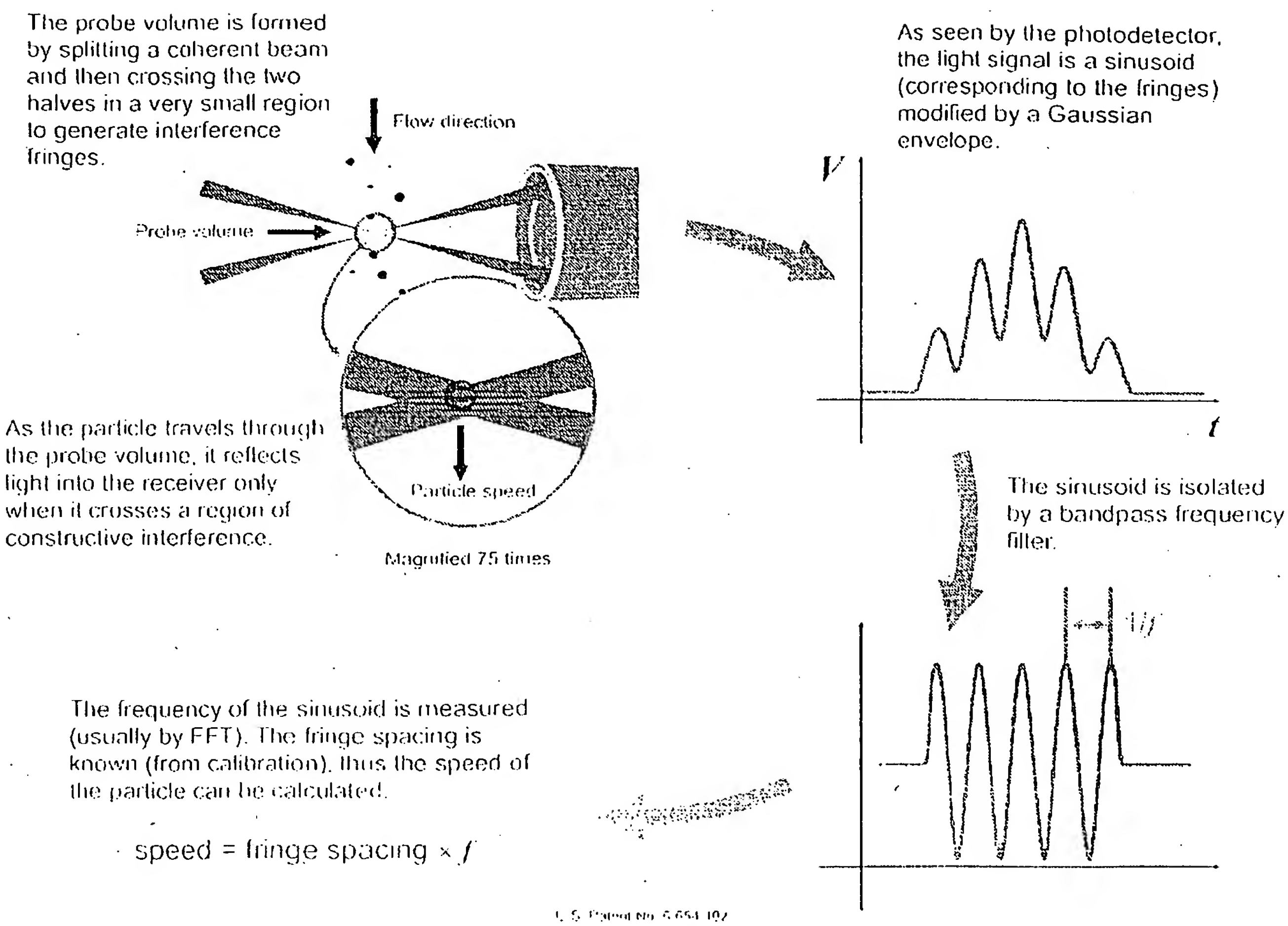
APPENDIX B


The probe volume is formed by splitting a coherent beam and then crossing the two halves in a very small region to generate interference fringes.
Flow direction
Probe volume
As the particle travels through the probe volume, it reflects light into the receiver only when it crosses a region of constructive interference.
Particle speed
Magnified 75 times
As seen by the photodetector, the light signal is a sinusoid (corresponding to the fringes) modified by a Gaussian envelope.
V
t
The sinusoid is isolated by a bandpass frequency filter.
1/f
The frequency of the sinusoid is measured (usually by FFT). The fringe spacing is known (from calibration), thus the speed of the particle can be calculated.
speed = fringe spacing × f